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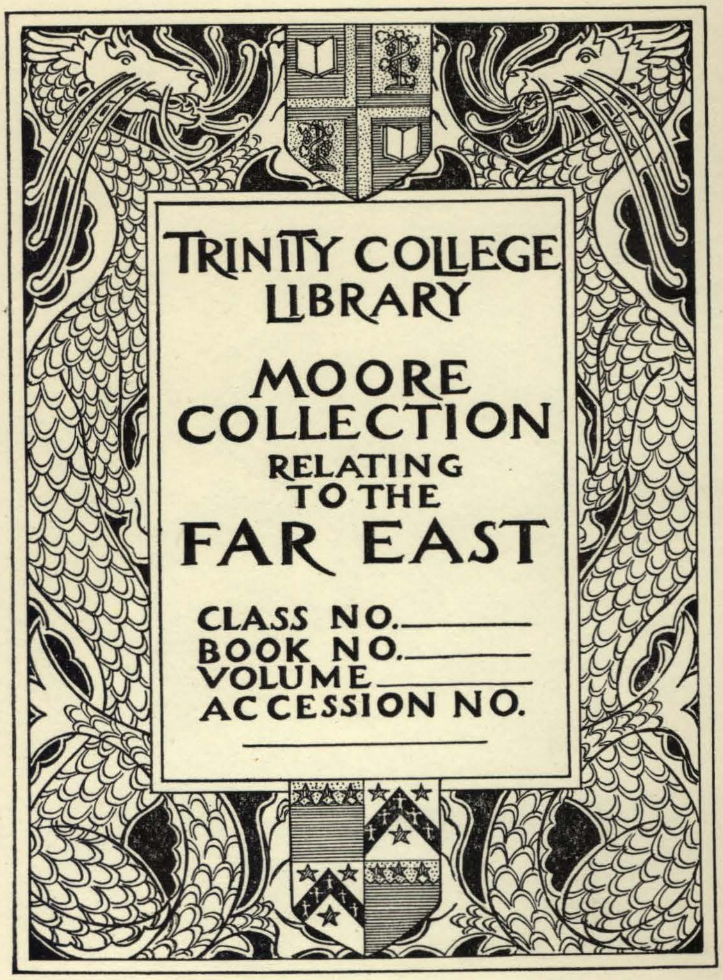

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CHINA.

IMPERIAL MARITIME CUSTOMS.

II.—SPECIAL SERIES: No. 31.

THE SOYA BEAN OF MANCHURIA.

Published by Order of the Inspector General of Customs.

SHANGHAI:
PUBLISHED AT THE STATISTICAL DEPARTMENT OF THE INSPECTORATE GENERAL OF CUSTOMS;
AND SOLD BY
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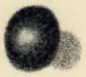
VARIETIES OF SOYA BEANS.



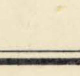
Large Black.

Small Black.

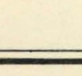
Large Flat Black.

Small Flat Black.

Green.



Yellow.



Yellow.

THE SOYA BEAN OF MANCHURIA.

INTRODUCTORY.

It is only in the last three years that soya beans have become important in intercontinental commerce, and their rapid emergence from obscurity has, indeed, been one of the most remarkable commercial events of recent times. The circumstance that "the rise of a great export trade in beans is the fact that overshadows all others, ... the soya bean thus taking at a bound a position equal to that of tea in the list of exports and, with the addition of beancake, even challenging the position of silk at the top of the list" *—this circumstance seems to call for some inquiry into the history and present position of the trade, and the following is an attempt to meet this want, by supplying some particulars of the bean considered agriculturally, of its uses in consumption, and of the history of the commercial dealings in the article for the last 50 years.

The date of its introduction into Manchuria is unknown, but the probability is that it came north from the central provinces of China many centuries ago. The pulse trade was of ancient standing when the first adventurous Westerners visited "Mandchoo Tartary," and in the annals of old China beans are not without mention, for in the "Shih Shuo," when Ts'ao Chih, threatened with death by his tyrannical brother Wên, Sovereign of the Kingdom of Wei, was offered his life on the seemingly impossible condition that he should compose a verse while walking seven steps, he extemporised four lines in which he likened himself to a bean and the beanstalk to the family and conjured his brother not to injure the whole family by destroying a part of it. Whether this classical bean is the soya must remain a matter of conjecture, but the story shows that the beans were a staple of diet in the early centuries of the Christian era. The original habitat of the soya bean was undoubtedly Eastern Asia, and its range—so varied are the conditions under which it thrives—is from Hokkaido, in the extreme north, to Java, Indo-China, and even to India, though in the latter country it would appear to find a rather less congenial home and to be of more recent origin. At the close of the 18th century the bean had found its way to England, its cultivation being recorded in 1790; while a report was written on the same subject by an agriculturist named Nuttall (whose name has been given to a variety) in New England in 1829. For several decades it was, however, regarded rather as a botanical curiosity than in any more serious light. The Perry expedition brought home some sample varieties in 1853; but the first attempt to grow the plant as a market crop was made in Austria, by Professor Haberlandt, in 1878—this attempt, however, did not meet with success.

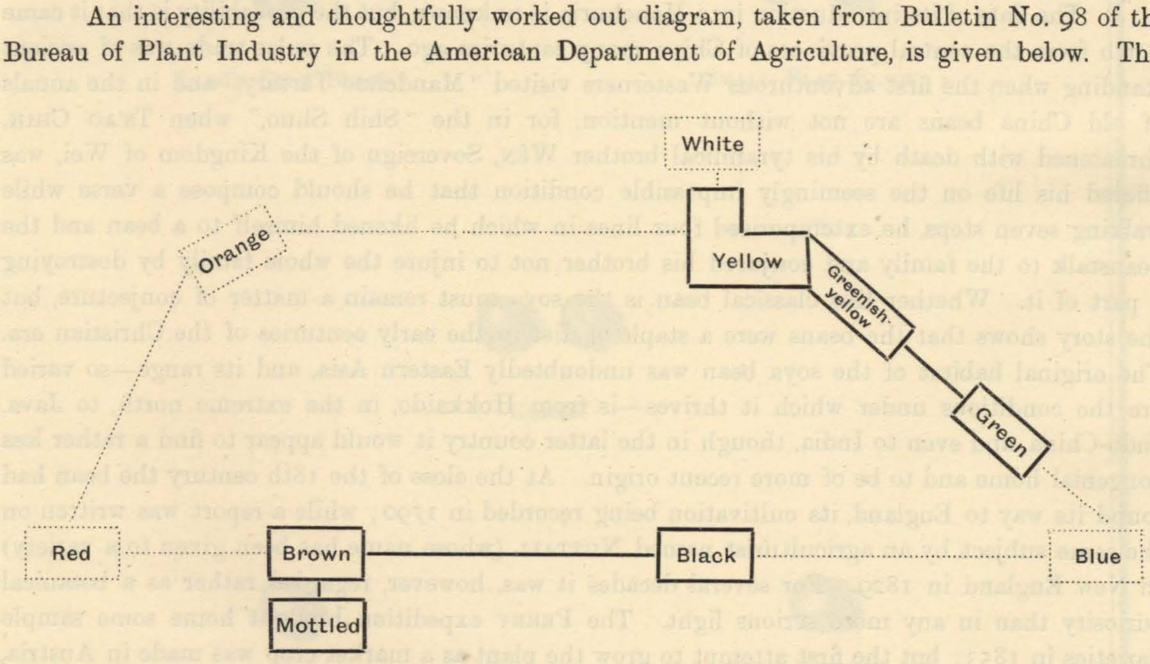
---

* Statistical Secretary's Report on the Foreign Trade of China in 1909.

VARIETIES.

In Sir ALEXANDER HOSIE'S book on Manchuria he enumerates eight varieties of *Glycine hispida*, MÖNCH,—or *Dolichos soja*, L., the alternative name for the plant. This classification is not scientific (indeed, no exact scientific division into separate and distinct varieties seems to have been made yet), but will be found adequate for commercial purposes and is that in use among the Chinese. In Manchuria three main classes are distinguished, by natural classification according to coloration of the seeds, but there appear to be no other characters correlated with seed colours, with the possible exception of richness in oil bearing. These three classes are:— The yellow, with its subdivisions of *pai-mei* (白 眉), or white eyebrow, from the whiteness of the hilum or scar on the saddle marking the point of attachment to the pod; the *chin-yüan* (金 元), or round golden bean; and the *hei-ch'i* (黑 臍), or black navel, from the dark brown hilum (in different varieties of this last sub-species the colour of the hilum and its size vary considerably). The green bean, or *ch'ing tou* (青 豆), has two sub-varieties—the first having a green epidermis and yellow interior, and the other being green both inside and out. The black bean, or *wu tou* (烏 豆), has three sub-varieties: the *ta wu tou*, or large black, having black epidermis and green interior; the small black, whose inside is yellow; and the *pien wu tou* (扁 烏 豆), or flat black, with yellow inside. But there is a great number of sub-species differentiated by some minute peculiarity from each of these—a Russian scientist is said to have distinguished at least 50. Two more should, perhaps, be named here: these are the small flat black, and a green bean with dark blotches upon it.

An interesting and thoughtfully worked out diagram, taken from Bulletin No. 98 of the Bureau of Plant Industry in the American Department of Agriculture, is given below. This diagram illustrates the probable relationships of the different groups of soya beans. The solid lines and rectangles indicate groups and probable relationships; the dotted lines and rectangles



indicate possible but still unknown groups, or those towards which, by careful selection, variation is progressing. The six colour groups recognised and described in this Bulletin are the following: (1) the black, (2) the brown, (3) the mottled, (4) the green, (5) the greenish-yellow, and (6) the yellow seeded. Of these the brown and mottled, though unknown in Manchuria, are grown in Korea, Japan, or the Yangtze Valley. Any line drawn between the yellow and the greenish-yellow seeded is arbitrary. Of 22 varieties described in the Bulletin, the remark is made that they must not be understood to be botanical varieties, but agricultural forms, differing in colour and size of seeds, in height and habit of plant, in earliness and lateness of maturing—all of which characteristics, except the colour of the seed, vary greatly with the climate and soil. It is to be hoped that the time will not be long delayed when the improvement of the stock by hybridisation will be made the subject of experiment in the bean districts of Manchuria. (A note made by a veteran missionary many years ago of the existence of a blue bean, in the Kirin region, seems worth recording, in view of the Bulletin's suggestion.)

THE PLANT.

The soya bean is an annual leguminous plant, with stout stems which are nearly erect but have a tendency to climb; this erectness gives them an advantage over cow-peas, for they are more easily harvested, and some of the taller sorts may even be harvested with an ordinary grain binder. The haulms are covered with hairs—which in some varieties are rusty looking, in others light green,—and they bear trifoliate leaves, which vary from the darkest to a light shade of green, and inconspicuous pale lilac or violet flowers. The plant averages 2 to 3 feet in height, though under the most favourable conditions it may even reach 4 feet and over, and bears pods about 2 inches in length. The number of these borne on each plant depends largely upon climatic conditions: thus, in 1908, in the Tiehling district, each plant was reckoned to carry 35–80; in 1909, 40–76; and in the present year (1910), 42–105. Where the plant stands 4 feet high and bears pods from top to bottom, its value to the farmer is, of course, greatly enhanced—here, again, selection might be brought in with advantage. The pods contain, on the average, from two to three seeds, with four occasionally and five not unknown. It is stated that when the weather conditions are favourable the number of seeds in each pod is increased above the normal; but this statement lacks verification. The pods are themselves more or less hairy, especially that of the black-seeded variety, doubtless as a defence against insect foes—these latter cause great loss in a dry season (one particular species being the worst enemy of the tender plant), while worms and weevils do damage to the seeds after the harvest. An advantage possessed by the soya bean is that it is self-pollinated, and therefore not dependent upon insects for fertilisation.

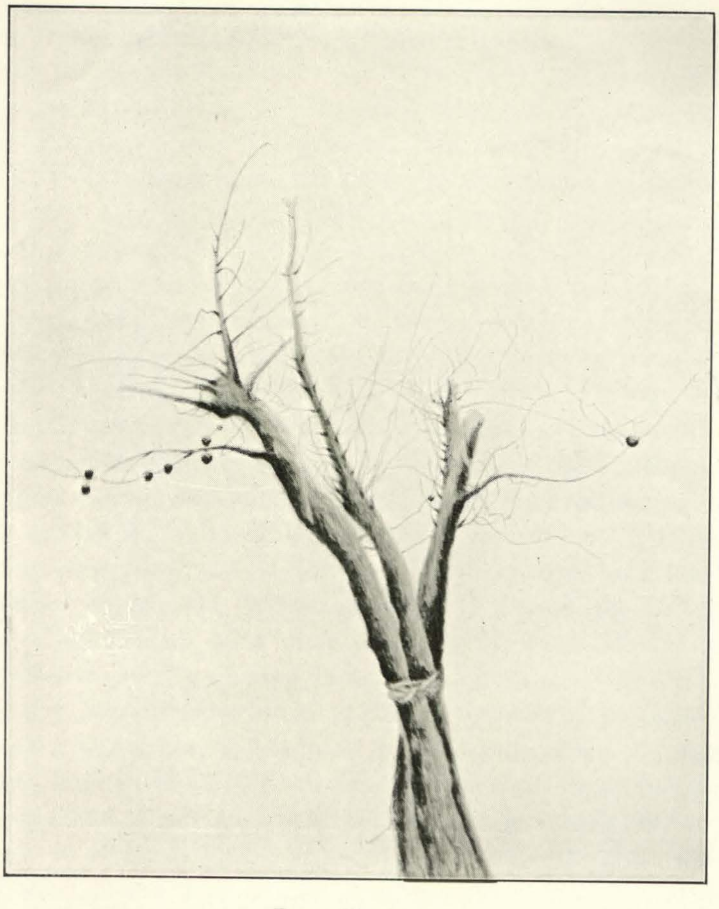
SOIL AND CLIMATE.

Soya beans are very resistant to drought, can endure slight frosts, and are capable of withstanding an excess of moisture, being superior even to maize and cow-peas in this respect. They grow best, as experiments conducted in Europe and America have shown, in soils of medium texture containing fair quantities of potash, lime, and phosphoric acid. Good results have sometimes been obtained in comparatively light soils, and an abundant crop is sometimes produced on land too poor for clover. In South Carolina good results have been obtained on sandy, limestone, or marly soils, and also on drained swamp or peaty lands.

In Manchuria this experience is borne out, as beans are to be seen growing everywhere, and even apparently flourishing in quite sandy soil. South Manchuria is divided by a line drawn from Shanhaikwan to Moukden, and thence southward to Kaichow and the sea, into a great plain on the one side and a mountainous region north and east of the line; this region is interspersed with fertile and sometimes extensive valleys, and is continued northwards in Central Manchuria and to the Yalu, while the great plain with its fertile prairie lands reappears in the fold of the Sungari beyond Changchun. But the bean district *par excellence* is the upland country beyond Moukden, where the hills—themselves the product of the decomposition of palæozoic rock (gneiss) by eruptive action—are overlaid with wind-deposited soil, which, being friable, is peculiarly adapted for the growth of a shallow-rooted plant like the bean. The bean grows well, too, in the meadows, with their water-deposited soil from the river-beds of the Liao and Sungari and their affluents; in these districts the rich, loamy soil, apparently formed of millenniums of leaves, guarantees bountiful harvests in all but abnormal years. One great advantage possessed by the Manchurian climate is that variations from the normal are neither of frequent occurrence nor, when they do occur, of great intensity, so that famines are almost unknown, and ample provision having been made for the supply of food crops such as kaoliang and maize, there is still room and to spare for the great market crop of beans, which is, indeed, gaining ground annually on other crops in Manchuria. The crop is seen from the shores of the Yellow Sea to as far as the 47th degree of north latitude, and the promising feature for the future is that the further north they extend the better in quality do the beans become (the best reports have been received of beans at Pehtwanlintze, far above Harbin)—the significance of this feature lying in the fact that the only direction in which the area of cultivation can be extended is to the northwards. The climatic conditions under which the soya beans thrive are, as has been pointed out by an American expert, far more varied in Manchuria than in the United States (where experiments with their cultivation have been made in almost every part of the country): they thrive equally well in regions occasionally subjected to periods of semi-aridity, in regions where the valley soils are flooded for several weeks during the rainy season, and in northern latitudes having a growing season similar to that in Minnesota. In the United States the soya bean is at its best between latitudes 37° and 43° north and east of the 97th meridian; but it, as well as other crops which flourish in the middle States, matures in Manchuria in a considerably shorter time—the reason being that the sunshine is stronger and more brilliant and continual than in North America, and crops are therefore forced to quicker maturity.

CULTIVATION.

In Manchuria the beans are produced almost entirely by hand methods. The plough, which is drawn by quaintly mixed teams of oxen, mules, and donkeys, has only one handle and a rough steel-tipped cutter. The seed is sown by hand, on top of the drills, in April, and is



Root Nodules.

covered by hand. A heavy hoe is used for a good deal of the turning and breaking. When the plant appears the earth is heaped up round it, so that the roots may derive the maximum of nourishment from the soil. Western experience shows that the soil should be well worked up and left free from clods and smooth, and that the seed is best sown in drills from 2 to 3 feet apart—as, indeed, is the native practice,—the exact distance depending upon the texture of the soil. If the object is to produce green fodder, good results may be obtained by sowing broadcast. From one-half to three-quarters of a bushel of seed per acre is required, though in the Liao and coast regions the Chinese use only half this amount. Unless the ground is very foul and full of weeds, not much cultivation is necessary after sowing, but the surface soil must be occasionally broken up. If the ground is inclined to pack or bake, it should be stirred after each rain, but not when the plants are very wet. The pod does not form well on flat ground in a wet season, because the growth is extremely dense, and when planted between rows of maize, kaoliang, or millet, the beans, though beneficial to these crops, are themselves very inferior in quantity and quality.

The harvest takes place in September, and the pods are usually harvested before they are quite ripe, as otherwise they are liable to burst on drying, a loss of seed being thus occasioned. The plants are pulled up by hand or cut with a straight-bladed sickle in Manchuria, and collected into small heaps in order to facilitate drying, and, when dry, the seed is separated by means of a cylindrical stone roller having longitudinal cuts on its surface, which is dragged over the plants by a mule as they lie on the threshing-floor. After this primitive threshing operation has been completed, the beans are winnowed in the usual Chinese method—that is, by throwing them against the wind. The only manure used is a compost of stable manure and earth, which is often taken from the miry pools formed in the roads—the despair of the carter but a boon to the farmer. In countries where chemical manures are used, it is only necessary to apply potash and phosphoric acid where they are lacking, for nitrogenous manure is unnecessary, owing to the property which the soya bean possesses, in common with other leguminous plants, of obtaining nitrogen from the air by means of colonies of bacteria.

SOIL INFESTATION.

A short description of this process may be of some interest, in view of the wasteful methods of Manchurian farming. The nitrogen-gathering bacteria form excrescences called nodules on the roots of the soya bean. By means of these bacteria, "enzymes" are produced, which are sent through all parts of the plant, mainly to the leaves, and the free nitrogen of the air is, by virtue of the enzymes, absorbed from the surface of the leaves and sent by some mysterious chemical process through the plants to the roots. The plant, by giving to the bacteria 2 per cent. of sugar food, receives in exchange 95 per cent. of nitrogen. When roots and legumes die in the ground, the nitrogen which the bacteria have already gathered and stored in the nodules is given to the soil, which is then rich in nitrogen. When the next crop is planted in that soil, no matter what that crop may be, nitrogen is there, and the crop will benefit by it. In "green manuring," when a crop of green leguminous plants is ploughed under, it decomposes and enriches the whole soil with nitrogenous compounds, the process being infinitely more beneficial than the heaviest application of fertiliser made in farm practice.

But when the Manchurian farmer pulls out the whole plant by the roots, or, having cut the crop with his sickle, proceeds to cut up the roots with a mattock for fuel, he is preventing the work of the bacillus radicicola from bearing its fruit and depriving his land of the provision made for it by nature. Thus, the soil in South-west Manchuria, where agriculture has been carried on for 400 years, has been bereft of all vegetable and organic matter and no longer bears harvests. The wonderful natural loaminess of the soil in the newer regions further north—for instance, at Shwangchengpu, where it is said that no manure is or ever has been used by the farmers in the 40 years since the land has been cultivated—this loaminess will assure good harvests for many years to come; but in the course of time even the richest soil will become exhausted, and to prevent such a disaster steps should be taken to inform the ignorance of the peasants who are at present deriving such great profits from their crops. If they could be shown the value of the process of "turning under" the green bean plants after the harvest, the fertility of the land might be preserved.

YIELD.

With regard to the yield of seed by the soya bean, there is considerable variation in the figures given. Sir A. HOSIE states that "the yield per acre, which requires from 16 to 18 ℔. of seed, is estimated at from 27 to 39 bushels, with a weight of about 40 ℔. per bushel"—that is, from 1,100 to 1,600 ℔. per acre. A commercial authority gives from 12 to 13½ piculs, or 1,600 to 1,800 ℔., per acre, the higher figure representing the production in the districts round the great collecting centre of Changchun.

In the United States the yield rarely approaches any such figure, that for black beans being particularly low—from 4 to 12 bushels per acre only. The green varieties give slightly better results—the lowest recorded being 5 bushels for the "Samarow," and the highest, 18 bushels for the "Guelph" in Indiana; while in Ontario (for the crop is raised in Canada also) 11 tons of green fodder per acre were returned, the large size and freely branching habit of this variety making it especially valuable as a pasture, hay, silage, and cover crop. The yellow-seeded group never falls below 14 bushels to the acre, and in Kentucky the "Amherst" has been known to give as much as 40 bushels, which is at least as good a figure as that obtained in Manchuria itself. The most detailed figures obtainable were those supplied by the kindness of a Japanese agricultural expert, which are summarised here as follows: in the Tiehling district, 49 bushels to the acre; from Changtu eastwards to Hwaijen and Tunghwa, 20 to 39 bushels; and in the poorer districts from Fenghwangcheng south along the Yellow Sea coasts, only 10 to 15 bushels—that is, a maximum of 2,000 ℔., or 15 piculs, to the acre, which figure, though seemingly very high, corresponds with an estimate made as long ago as 1867 by the Rev. A. WILLIAMSON, who travelled in the Upper Sungari district at that time, and who appears to have been a very close observer.

USES OF THE SOYA BEAN.

(1) In the Far East.

In the Far East the beans are put to a variety of uses:

(*a.*) As a foodstuff they are made into—

i. Bean sauce, or soy, called in Japan "shoyu" (whence the name "soya"), and in China, *chiang-yu* (醬 油). It is made by boiling the beans, adding an equal quantity of wheat or barley, and leaving the mass to ferment; a layer of salt and three times as much water as beans are afterwards put in, when the liquid is pressed and strained. The following method is more scientific and cleanly than the native way:—Equal weights of beans, coarse barley meal, and salt should be taken, the beans washed and boiled until tender, and pounded in a mortar, the barley meal being added gradually. The mass should then be placed in an earthenware bowl and covered with a cloth, to be stood in a warm place for several days, until it is sufficiently fermented, but not mouldy. The salt is then dissolved in water and stirred into the mass, which must be kept closely covered for three months, during which time it must be stirred for one hour daily. At the end of this time it is strained through a fine cloth, as much of the moisture as possible being extracted by pressure; after it has become clear the sauce is ready for use.

ii. The Chinese paste *chiang* (醬)—not the same article of diet as the Japanese paste miso (味 噌).* It is made by farmers, and eaten with fish, meat, and vegetables, while the more expensive Chinese soy is only made by wealthy families and restaurant-keepers and is not consumed by the very poor.

There are two kinds of *chiang: ta* (great) and *hsiao* (small). The former is made in the following way:—The ingredients—1 *tou* of yellow beans and 2 *tou* of water—are boiled until the mass of the former can be readily crumbled in the fingers. It is next ground with a wooden pestle in a tub into the shape of a pancake, and laid on a mat in a cool place for fermentation, which is complete at the end of two months. The fermented mass is than re-ground to powder and 4 *shêng* (native pints) of salt with water are added, after which it is placed in the open and stirred occasionally. As the water evaporates more must be added, and in 15 days the mixture is ready for consumption.

Hsiao chiang is made in the same way, but the ingredients are 1 *tou* 1 *shêng* (1 peck and 1 pint) of beans to 1 *shêng* of maize, to which 5 *shêng* of salt are added.

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* Particulars as to the method of preparing Japanese bean paste, or miso, are given in a Supplementary Note at the end of this report (page 27).

iii. *Tou-fu* (豆腐), or beancurd—made from green or yellow beans, the first giving greater quantity but poorer quality. The beans are steeped in water until they swell considerably, then ground in a stone mill, and passed through a strainer which retains the epidermis of the beans; after which they are boiled in a pot, poured off into a jar, and well diluted brine added to them—this being stirred in, causes coagulation of the proteid compound legumin or vegetable casein, and the mixture is ready to be drained off in an hour and cut into blocks for sale. Other substances are produced besides the curd (as enumerated in Sir A. HOSIE's book, from which the above description is taken), such as *tou-fu kan-tzŭ*, or dry beancurd cakes; *tou-fu nao*, or curd brain, produced by putting calcium sulphate or gypsum (itself a product of Manchuria) into the curd instead of brine; *tou-fu p‘i*, or curd skin, the scum of the boiling filtrate, which is taken off and hung to dry; *ch‘ien-chang tou-fu*, or wafers, layers of legumin pressed in cloth; and *tung tou-fu*, or frozen curd, which is produced by freezing and then drying the substance.

All these foodstuffs enter largely into the diet of Chinese, Japanese, and Koreans, the bean playing the most important part among subsidiary crops in Japan, as testified by the latest returns of bean consumption in that country—of a total consumption of 5,178,332 *koku*, 2,813,837 were used for making miso, 890,359 for tofu, and 600,000 for soy.

(*b.*) The beans are also consumed in the form of flour, as a table vegetable, and in soups, and in Japan are used for making confectionery.

(*c.*) Bean refuse is used as a fertiliser, and for fattening the hogs which are such a familiar feature of the Chinese farmyard.

(*d.*) Bean oil is used, where it has not been superseded by kerosene oil, as an illuminant—one attraction which it possesses (as has been pointed out in a Consular report) being that no lamp is necessary to hold it, the wick being inserted into the basin or plate containing the oil; this seems but a small consideration, but, in point of fact, has considerable weight with the thrifty Chinese peasant.

(*e.*) The oil is used, as a substitute for lard, in cooking. Although it is inferior to rapeseed and sesamum oils for this purpose, these oils cannot compete with it in point of price; the recent advance in price, due to the foreign demand, may, however—if sustained, as seems certain,—go far to change the positions of the oils relatively to each other. In spite of its unpleasant characteristic odour and unpalatability, the poorer classes in China consume it in its crude state, but among the rich it is boiled and allowed to stand until it has become clarified.

(*f.*) As a lubricant, bean oil is used for greasing axles and parts of native machinery in use in the arts and crafts. For the former purpose large quantities are consumed in North China and Manchuria.

(*g.*) Other uses in South China are for the making of waterproof cloth, paper umbrellas and lanterns, and the oil is also mixed with lacquer for manufacturing varnish and printing ink.

Beancake.

Beancake—the residue after the oil has been expressed from the beans—has two uses in Eastern Asia. For centuries it has been sent from Manchuria (and in a less degree from Shantung) to the provinces of Fukien and Kwangtung—the chief ports of delivery being Amoy, Swatow, and Canton—as a fertiliser for the sugar plantations. From these ports, with their foreign communications, its use has spread to the plantations in Java and the South Sea Islands *viâ* Hongkong. It has also been found valuable as a fertiliser for yams; and for many years has been the staple of a growing trade with Japan, where it is employed in the paddy fields, having been found to possess fertilising qualities superior to those of the fish manure of past ages, which contained too high a proportion of oil for the purpose for which it was used, being liable to breed insects hurtful to the crops. Although not at present used in the rice fields in China, beancake will probably come into use in them eventually, and possibly also in Indo-China and Siam. In Japan it is also employed as an alternative manure for mulberry trees, and in Manchuria for millet, in localities where the soil is poor, or in some places even for cabbages, when it is planted with the seed. A peculiar use to which it is put is in the Manchurian wild silk districts, where, mixed with oil and arsenic, it is plastered on the roots of the oaks where the worms are feeding, the mixture attracting and poisoning the insects which prey on the oak-spinners.

As cattle-feed, beancake is used in Manchuria for horses and mules—only, however, when very hard work is being done, and mixed with bran and kaoliang stalk. Its muscle-forming properties are also recognised in Japan, where it is fed to horses; but it is useful also as a fattener for stock which is not employed in farm work, such as hogs. In no case is beancake given as the sole ingredient of diet.

In China itself the wasteful method of feeding stock with beancake has been commented on by foreign agriculturists, who argue that the common-sense method of using the soya beans as fodder is to give them to stock in their original form, and to use the valuable animal manure resulting as a fertiliser.

The following chemical analysis of beancake is an average taken from the results of four analyses made in Manchuria:—

WATER.	OIL.	ALBUMINOIDS.	CARBO-HYDRATES.	FIBRE.	ASH.
Per Cent.	*Per Cent.*	*Per Cent.*	*Per Cent.*	*Per Cent.*	*Per Cent.*
17.71	9.60	42.16	19.43	6.54	4.56

(2) In the Western World.

In Europe the consumption of soya beans as a foodstuff is small proportionately to their other uses. Refined bean oil may be used as a salad dressing in place of other oils (but, owing to its unpleasant odour, is usually mixed with an oil of animal origin or with rapeseed oil), or in the manufacture of margarine, when a greater percentage of soya oil than of copra oil is allowed.

Chemical analyses of the beans made in Europe and America show considerable variation in the percentages of the different constituents. Thus, moisture percentage varies from 9.10 to 12; that of ash, from 4.32 to 6; that of albuminoids, from 34 to 41.17; that of fibre, from 4.20 to 5.70; that of carbohydrates, from 20.74 to 28.80; and that of oil, from 15.62 to 17; while a minute amount of sand was present in some cases. An average taken from a dozen analyses shows the following chemical composition:—

MOISTURE.	ASH.	ALBUMINOIDS.	FIBRE.	CARBOHYDRATES.	FAT.
Per Cent.	*Per Cent.*	*Per Cent.*	*Per Cent.*	*Per Cent.*	*Per Cent.*
11	4.90	38.30	4.80	24.30	16.70

In Manchuria, however, the yield of oil is rarely less than 18 per cent. and, as in the following analysis made at Moukden, is found to rise as high as 20 per cent. (which is also the figure given in Hokkaido): moisture, 5.89; ash, 4.69; albuminoids, 36.93; fibre, 685; carbohydrates, 25.64; fat, 20. The black beans contain an equal quantity of oil, but it is not of the same quality as that contained in the yellow beans.

According to a series of articles in the journal "Milling" (from which this paragraph is abridged), experiments have been made with soya beans blended with both flour and meal, the proper proportion having been thereby ascertained to be one-fifth for mixing with flour and one-sixth for mixing with meal. Thus blended, the soya imparts a pleasant flavour and, being exceptionally rich in albuminoids, it gives a considerable increase in food value (soya beans are nearly three times as rich in albuminoids as oats and wheat). German millers are experimenting with the beans in the attempt to make brown bread by mixing with rye flour. But the best use to which they can be put is undoubtedly for making biscuits, for there is no difficulty, as in the case of bread, in getting a loaf which shall not be heavy and sticky; the biscuits are crisp and nourishing, and the oil in which the beans are so rich is not so detrimental to biscuits as to bread. In any case, as soya flour cannot be bleached, it is unsuitable for white bread making. The peculiar flavour of the beans is appetising on account of the casein contained in them. A minor advantage is that the loaf cuts quite clean, without crumbs, and the only disadvantage is that the top of the loaf easily breaks away, thus showing that the rich albuminoids of the soya flour have not the qualities of the white flour. There may be a great future before soya meal (the residue when the oil is extracted by a chemical process), for brown bread is gaining in popularity, many people preferring the highly flavoured brown loaf, and it has only failed to attract more generally because of the poor quality turned out by bakers. It cannot be doubted that, if pains were taken, the use of brown bread would spread; and soya flour, by reason of the large proportion of albuminoids, phosphates, and casein it contains, may be the very blend required to bring brown bread up to that degree of favour which may extend its use very largely. It is perhaps worthy of record that the biscuits already constitute an article of export from England—they are manufactured by two firms in the north.

Soya milk is a liquid, closely resembling cow's milk, which is made in Japan. The beans are soaked in water, crushed, and boiled in water. It has great nutritive value, and a substance like condensed milk can be obtained from it, by adding a little cane sugar and a little potassium phosphate, and evaporating down in vacuo. It is valuable as food (except for infants), and especially in tropical countries, but is, unfortunately, not very palatable. The milk is used in the preparation of cheese.

French culinary ingenuity has even, according to reports received, employed the bean as a substitute for coffee beans.

Dr. Edie, in a bulletin published for the Liverpool University Institute of Commercial Research in the Tropics, says:—"As fodder the soya bean is of great value, milch cows fed on it giving better results than when no beans are included in their food. Owing to the fact that the time taken to reach maturity varies, in different varieties, from 85 to 130 days or more, green forage can be obtained over a prolonged period by suitable selection. Hay made from the soya plant has a very high feeding value, but unless cut at the proper season the stem becomes rather woody in character and too coarse to be eaten very readily, unless chopped; therefore it is more profitable to grow the crop for ensilage. The silage keeps well and is eaten readily, and the crop can be cut for this purpose at any time from early blooming to early maturity. A mixed ensilage of beans and maize is best."

A final advantage has been claimed for the soya bean by Japanese authorities, who state that it contains no sugar or starch, and therefore use it as the basis for foods for persons suffering from diabetes.

The Use of Beancake in Europe.

The cake as made in England differs a good deal from the Manchurian product, being oblong in shape, not more than an inch in thickness, very hard, and heavy. It resembles linseed cake, but is lighter in colour, and has a characteristic taste resembling that of peas. The nutritive value is about equal to that of decorticated cotton seed cake. It is used almost entirely for feeding cattle, and the cheapness of the cake has made it very popular. Some hesitation was shown at first in Denmark—a great butter-producing country—in regard to its introduction, as it was feared that the taste of the butter might be affected by feeding it to cows; but experiments have proved the reverse, and the demand in that country and in Holland is steadily increasing. Owing to its excessive richness in albuminoids, the cake should be used with the same precautions as are observed with decorticated cotton seed cake, which is said to be unsuited to calves and lambs, and when used for adult stock should be mixed with an equal weight of some cereal product, such as maize, barley, or wheat meal, or American flour.

The results of experiments made early in 1909, in feeding milch cows with beancake and decorticated cotton seed cake respectively, at the Royal Agricultural College, Cirencester, produced the following conclusions:—

1°. The yield of milk in each case seems to be little affected by the kind of cake used.

2°. The percentage of butter fat, in the case of the beancake, remained almost constant, a slight increase, if anything, being noticed; with the cotton seed cake, however, the percentage had a tendency to fall.

3°. The butter produced by the beancake was of a soft, oily nature, and quickly churned, but it yielded well, as is shown in the butter ratio—1 ℔. of butter to 26.12 ℔. of milk. The butter produced by the cotton seed cake, on the other hand, was hard and took a longer time to churn; the yield, however, was not so good as from the beancake—1 ℔. of butter to 27.42 ℔. of milk. From this it seems that the beancake would be the better food for winter feeding, especially at the present prices of each.

4°. The butter from the beancake was of a decidedly paler colour and somewhat inferior flavour, as compared with that from the decorticated cotton seed cake.

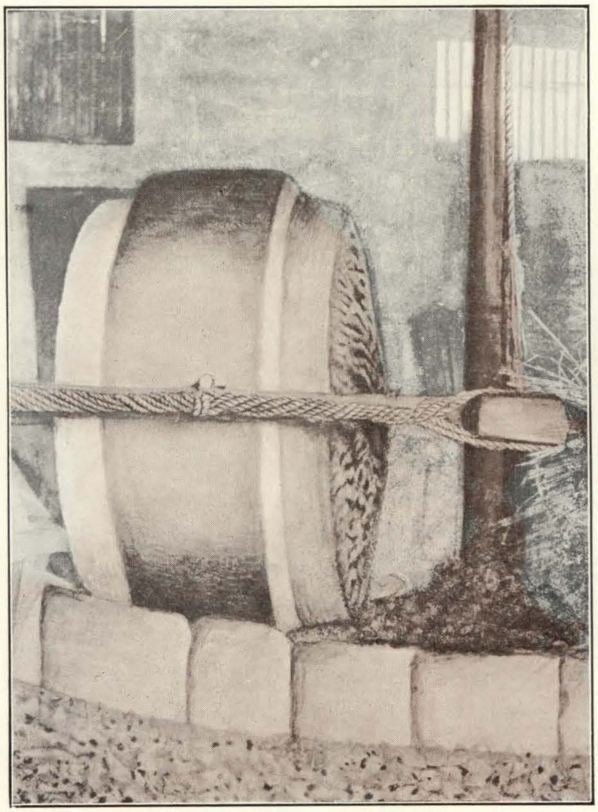
5°. No difference as to the laxative effect or otherwise of the two cakes was noticeable on the cows.

The following analyses and prices were given:—

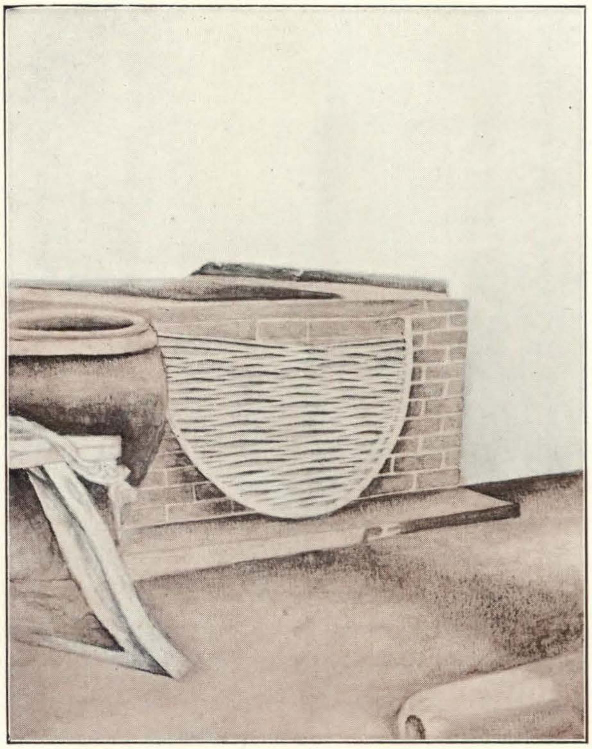
	Soya Beancake.	Decorticated Cotton Seed Cake.
Oil	6 per cent.	8 per cent.
Albuminoids	40 „	34 „
Price	£6 10s. per ton.	£7 10s. per ton.

Uses of Bean Oil in Europe.

One of the principal uses to which bean oil is applied in Europe is in soap manufacturing, for which purpose it can be made use of in its crude state. The scarcity of cotton seed oil in recent years has forced manufacturers to find a suitable oil as an alternative, and bean oil, at an attractively low figure, was eagerly resorted to. It cannot be said, however, to approach cotton seed oil in quality, for it is not so uniform in character and is liable to become rancid. A paper issued by the British Imperial Institute, quoted here and elsewhere, states that bean oil belongs to the class of semi-drying oils—that is, it has qualities intermediate between those of the drying oils, such as linseed, and the non-drying, such as almond and olive. On exposure to the air a thin skin is gradually formed on the surface. It resembles cotton seed oil in many ways, but is of a pronounced drying character, as is indicated by its higher iodine value. The oil consists mainly of the glycerides of palmitic, oleic, and linolic acids. A sample of oil analysed in England gave 0.22 per cent. of unsaponifiable matter, and 2.28 per cent. of free acid calculated to



Massive Granite Roller for crushing Beans.



Steaming Vat with Grating on which Beans are placed in Gunny Bags during the Steaming Process.

oleic acid. The proportion of solid fatty acids in the oil is, approximately, 11.5 per cent. of the total mixed fatty acids; 80.26 per cent. of liquid fatty acids have been found. The bulk of the solid fatty acids is stated to consist of palmitic acid; the liquid fatty acids consist of oleic and linolic acids. It has been found on analysis at Dalny that the proportion of unsaponifiable matter is much less than the above.

Other purposes for which bean oil is used are in the manufacture of various edible goods, toilet powders, paint oils (although for this purpose its less volatile character in comparison with other oils is against it), lubrication and lighting oils. As has been already mentioned, it can be used as a substitute for olive oil as a salad dressing; and, as experiments in Germany have shown, it may be used with linseed oil, if mixed with the latter in the proportion of one to three, when its presence can only be detected by exact analysis. For the manufacture of candles it is not to be recommended, as it is not combustible enough for the purpose, and although it can be made so, the process would be too costly to be profitable.

THE BEAN OIL AND CAKE IND STRY IN MANCHURIA.

In the manufacture of beancake by the native method there are four processes—crushing, steaming, preparing for the press, and pressing,—and in the modern mills the same order is also necessarily followed. The native process has been minutely described by Sir A. HOSIE, and but little space need be given to it here.

The mill consists of a massive granite grindstone, which has the centre of its rim cut down and highly polished, the margin on either side being merely dressed. The stone rests on a circular platform enclosed by a low wall, the edges of the platform being also of polished granite, and having the centre of the roller resting on it. In the centre of the platform is a wooden upright, round which, being fixed into it, the stone is pulled by a mule. The bean feeder is fastened to the opposite side of the plank in which the axle of the roller is secured, and the beans, on being fed into it, pass through a square hole on to the stone, where they are crushed. Minor arrangements—such as the slide which regulates the flow of beans, the wooden hoop to prevent them falling off the stone, the rake to spread them evenly over it, and the iron blade arranged in a slanting direction which sweeps the beans off the stone as soon as they have been crushed—complete the apparatus necessary for the preliminary crushing process.

The second process is that of steaming. The beans, crushed into wafers, are taken from the gutter round the platform, where they have fallen, and are placed on a gunny bag over a wooden grating which is laid upon a pot of boiling water (as shown in the illustration).

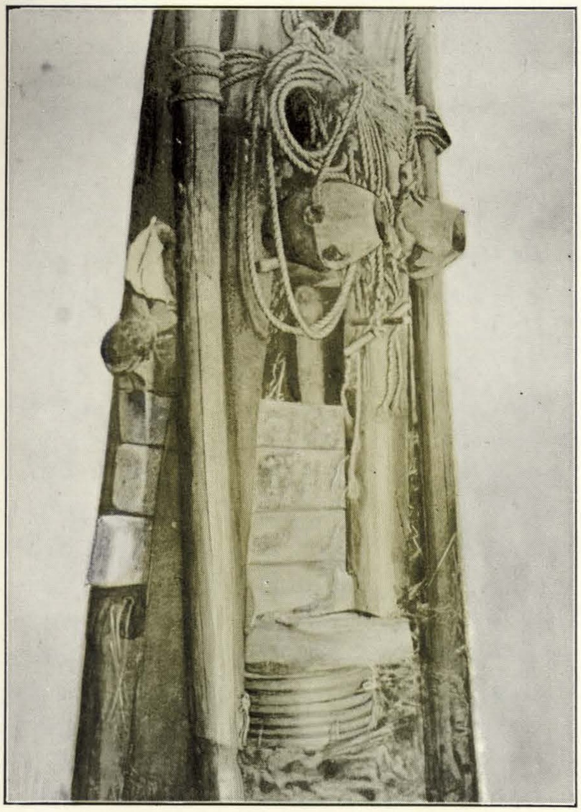
After 15 minutes steaming, the beans are prepared for the press in the following way:—Two iron hoops are placed on top of each other inside a larger wooden hoop, with two bundles of grass spread out in a fan shape in the middle, this latter device being exactly similar to one described in SMOLLETT'S "Travels in France and Italy" as being in use in the Riviera olive presses in the 18th century. The grass being kept in position by another wooden hoop, a kind of mould is thus formed, into which the steaming beans are poured, after which the wooden hoops are withdrawn and the grass bent inwards to cover the beans, now pressed down tight by the feet of the workmen. To keep this grass wrapper in position over the beans two short iron rods are placed crosswise over it. The first cake is now ready for the press, but four more are made before they are placed in it, one on top of the other.

The accompanying illustration shows the method by which the oil is expressed. The four massive beams bound together with iron—the stout logs and the wedges which, when driven home, press downwards upon the cakes and force them to yield up their oil—and the square receptacle at the base into which it flows, to be thence drawn off into undergound vats—are clearly shown. When the iron hoops meet, the oil has been expressed, but the cakes are allowed to stand while the next batch is being prepared. When taken out, the cakes have their rims pared even with a semicircular cutter. The cakes gain in weight by steaming to the extent of 5 or 6 catties each, but this gain is more than counterbalanced later on, in the warehouse and on the sea voyage. The percentage of oil and cake depends largely upon the respective prices offered for each, and this can be regulated by using beans of different varieties; thus, when oil production is more profitable, yellow beans are used, but when cake is required, green or black beans are mixed with the yellow or used alone.

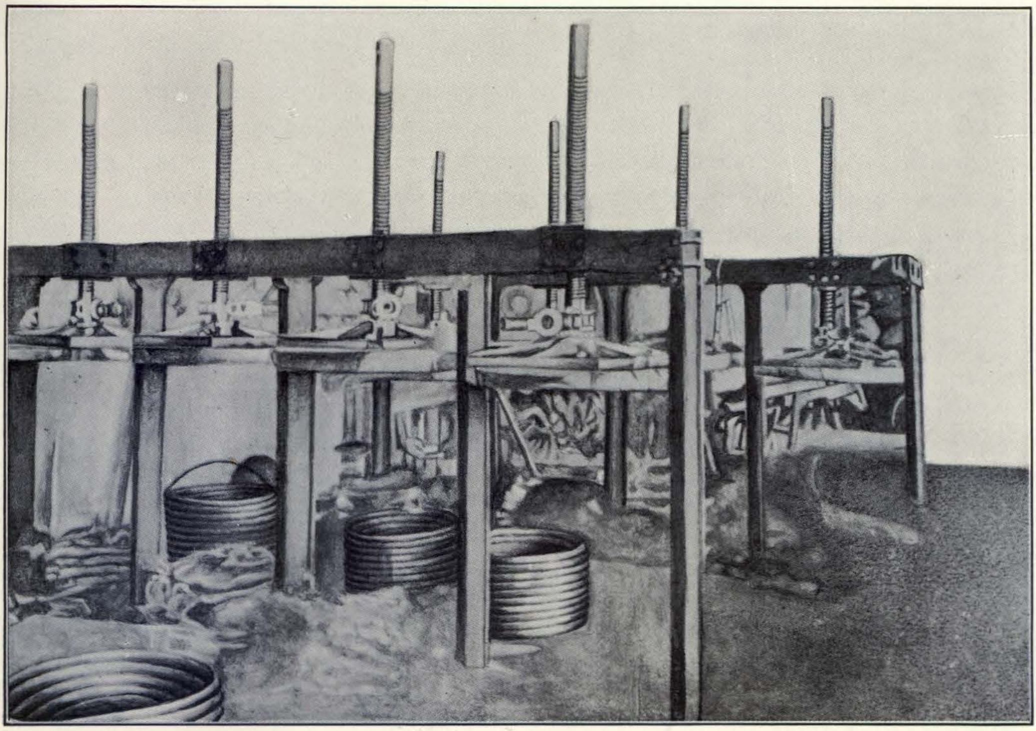
In the mills equipped with modern machinery the beans are crushed in great quantities by steam-driven rollers, carried down a funnel to the oil-extraction room, and there steamed by vapour which can be turned on and off at will, the process being rapid, owing to the force with which the steam plays upon the wafers. In some mills it has been found better to discard steam pressure for the oil expression and to do it by hand, as in the native mills, the reason being that hydraulic pressure is so rapidly completed that a less flow of oil is produced than by the slower hand process. Sir A. Hosie found that steaming increased the weight of an average cake from 54½ to 60½ catties (other authorities giving even as much as 13 per cent. gain in weight)—the loss by trimming the cakes was about 2 catties,—so that the final product weighed 53 catties, leaving 5½ catties of oil extracted, or rather over 10 per cent. But it is universally admitted that 9 per cent. is the utmost that can be extracted in an ordinary way. Thus, only half the amount of oil present in the beans is extracted, and the balance left in the cake—apart from any consideration of waste—detracts very much from the fertilising value of the product. By gasoline extraction the beans give up practically all their oil which, as refined by this process, is a clear, pure liquid, hardly resembling the muddy, dark oil produced in the old way.

The average weight of beancake for export at Dalny is only 46 catties, which is also the weight given in the Japanese trade returns for the imported article. It is much cheaper in Japan than either herring residue or ground bone. Analysis in that country has shown it to contain, on an average, 6.5 per cent. of nitrogen, 1.5 per cent. of alkali, and 1.2 per cent. of phosphate. For a quarter-acre rice field, two well-pounded cakes, with half a ton of farmyard manure and 80 ℔. of phosphate of lime, produce the best effect, the phosphate being added because the bean is too nitrogenous for graminiferous plants—it can, however, be used alone for cabbage and other leaf crops.

(In the accompanying illustration an example is given of the type of seed crushing and pressing machinery turned out in Japan for sale to small Chinese mills.)



Native Bean Press, showing Cakes in Receptacle and Logs driven in to press out the Oil.



Modern Bean Press set up in Bean Mill.

TRADE DEVELOPMENT.

Since the opening of Newchwang to foreign commerce the records of the bean trade have been kept, and it may be interesting to bring them together into one compass in this report.

When the first British Consul at Newchwang, Mr. MEADOWS, took up his residence there, in 1861, he found the bean trade an ancient and flourishing institution. Yingtze—the new Newchwang—had been since 1835 a growing port of shipment for the great coastal trade in beans and beancake on which Manchuria's prosperity has always depended, and the port was gradually superseding Kaichow and Chinchow, whose junk trade with the South is described by GUTZLAFF in 1831. River junks capable of carrying 40 tons of grain, and drawing 4 feet, brought the beans down the Liao and loaded them into the great sea-going junks which, with cargoes of 100 tons and more, set sail for the coast ports of the southern provinces. The sugar plantations in these sub-tropical regions had for centuries drawn upon the northern beancake for fertilising, and beans were needed also for the southern mills, where their oil was extracted and used as a substitute for ground-nut oil. The earliest available returns for Swatow—those of 1860—show that 379,009 piculs of beancake, valued at $783,762, and 61,154 piculs of beans, valued at $107,235, were imported; by 1864, when the first port tables for Swatow were published, the import of beancake had increased to slightly over a million piculs, of which half came from Newchwang, nearly half from Chefoo, and a small amount from the Yangtze ports. (The present report deals only with Manchurian soya beans, but a passing reference to those produced in other provinces may be useful. In the Yangtze Valley the beans are of inferior quality, and experiments with shipment to Europe have not met with success, but there is a considerable production. In Shantung they are grown, but the exportation from Chefoo, at one time of some importance, has of recent years declined. A scheme was in contemplation in 1909 to export Honan beans, which come down the Yellow River, to Europe *viâ* Tsingtau, but the expenses incurred were too great, and the quality on analysis proved poor.)

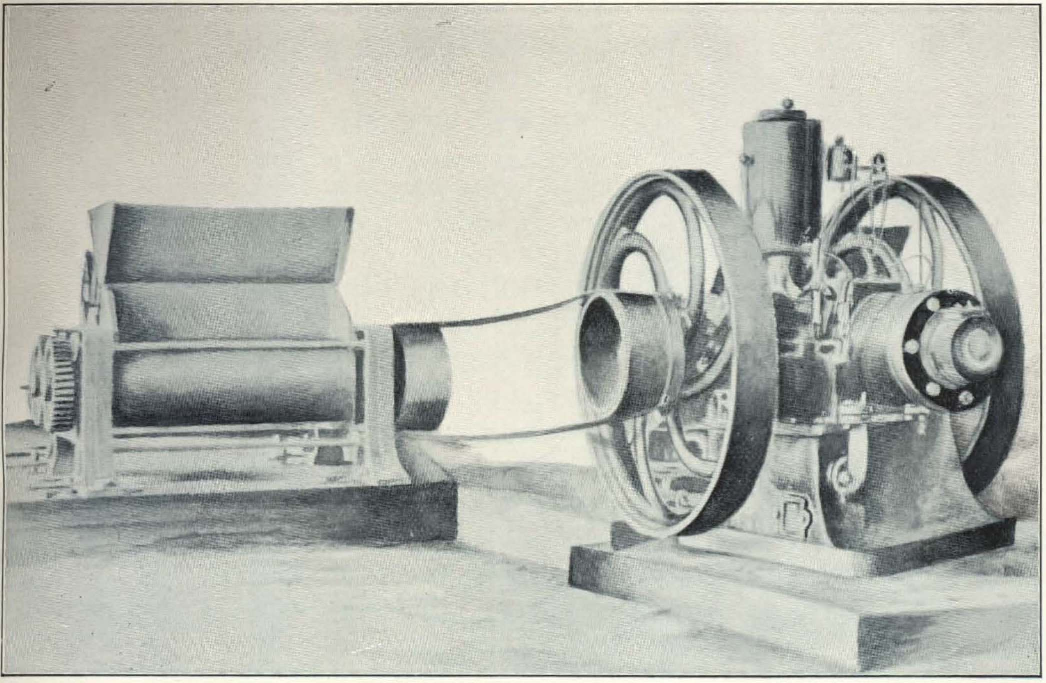
In 1864 the import of beans from Newchwang to Swatow had risen to more than double that of four years previously, and the other southern ports show similar increases, the trade in foreign bottoms being now in full swing. By the British Treaty of 1858, which opened Newchwang, the export of pulse and beancake from that port and from Tungchow (Chefoo), in British vessels, was prohibited; but this prohibition was removed by agreement in March 1862, and the trade developed with great rapidity. In 1861, the first year in the port's history, only 34 foreign ships visited Newchwang, but four years later 271—most of which were engaged in the pulse trade—entered and cleared. The diversion of the carrying trade from junks to the speedier sailing vessels, or even steamers, under foreign flags, caused consternation among the owners of the native craft, and efforts were made to revive the prohibitory enactments; but without success, and in 1869 the prohibition, till then in force, against exportation to foreign ports was withdrawn. By that year the extent of the damage done to the junk trade was past repair, for 1,143 fewer native vessels left the port than in 1867.

Even in these early days it was recognised that the promising feature of the trade of Newchwang was that the prosperity of the port did not depend, as was the case at most treaty ports, on a country already thickly populated and cultivated, but that the increase year by year of the area of cultivation over vast tracts of virgin soil would bring with it a corresponding increase in external trade. That no striking development of trade occurred for many years was due to the restrictive policy of the Central Government, which until the "eighties" discouraged immigration into Manchuria. The first figures showing the amount of beans brought into Newchwang from the producing districts are those for the season 1861–62, when 1,450,000 *shih* (of 400 ℔.) came to the port. For the next four years the amount brought in varied from 1,130,000 to 1,620,000 *shih*; but after 1866, when the bands of banditti, whose depredations had at last roused the authorities to send a large force against them, were suppressed, the increased cultivation and improved facilities for transportation gave an impetus to trade. In 1869, although the harvest in the west was poor enough to cause a famine, the amount brought to Newchwang was, nevertheless, over 1,700,000 *shih.*

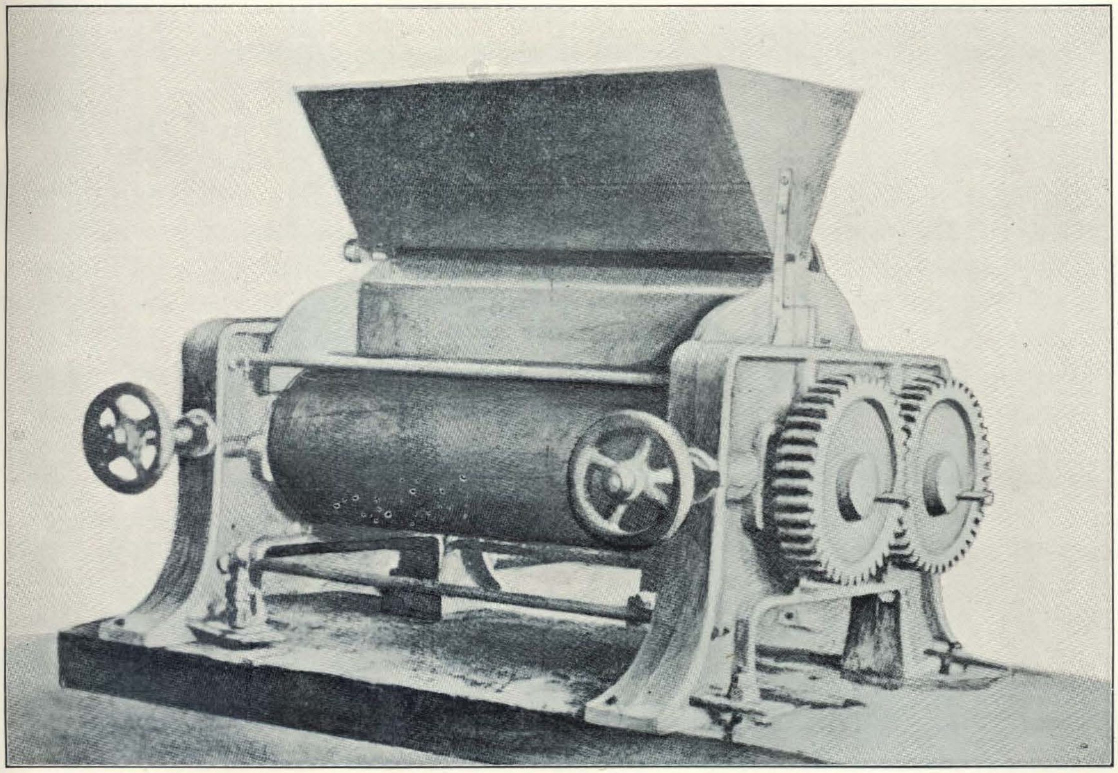
Statistics of exports begin in 1864, when the Customs opened, and the earliest figures recorded were 816,000 piculs of beans, 842,000 piculs of cake, and 7,312 piculs of oil exported. These figures had risen in 1867 to just over a million piculs of beans, 1,163,000 piculs of cake, and 23,000 piculs of oil; but in 1868 the trade received its first check—a combination of disturbing factors, such as only too often occur in Chinese commercial history, caused a falling off in exportation. The sugar crop in Fukien had been so good in 1867 that less was planted there in the next season, and consequently the demand for beancake diminished, while, in addition, stocks were held back by merchants, who preferred doing this to reducing their rates to a point low enough to induce planters in the South to manure less valuable crops than sugar and cotton.

Most of the bean oil which was brought to Newchwang in the early days of the port came down from the regions of the Upper Sungari, being carried in chests constructed with pine-wood at Kwanchengtze. The beans were converted into oil in districts far removed from the coast, as oil was better able to bear the heavy cartage rates than the beans themselves. The carts took the western road, in preference to the eastern official one from the great mart; but this was not due to fear of official exactions, for Manchuria was favourably treated in the matter of taxation. For shipment, the oil is placed in willow baskets lined with oiled paper and packed in junks specially constructed for their carriage. Except when unusually large profits were expected to be made by speedy delivery, the oil was not shipped in steamers; for, when time was not a matter of primary importance, greater care could be devoted to stowage in junks, and loss by leakage avoided.

With regard to prices, the first annual valuation by the Customs dates from 1864, and gives *Hk.Tls.* 1.25 for beans, and *Hk.Tls.* 6.25 for oil, per picul; but these high rates could not be maintained, as Peruvian guano and Java and (more recently) Hainan oil-cake were entering the southern market as competitors with beancake, and Manchuria was left the choice between reducing her prices and consuming her only money crop locally. The course of prices since 1864 is shown in a table at the end of this report, the table being that which appears in the Customs decennial report for the period 1892–1901, brought up to date from subsequent Customs returns supplemented by information supplied by the Newchwang office. The figures for beancake do not appear in the table until 1870, but from other sources it is known that



Oil-motor and Crusher at work.



Modern Crushing Machinery.

10 cakes cost, in 1862, *Newchwang Tls.* 1.5 to Tls. 1.10, and that the price rose rapidly until it reached Tls. 4.80 in 1867; in the following year, under stress of the conditions related above, it fell from Tls. 3.70 in May to Tls. 2.75 in December; and in 1870 the price first appears in the Customs returns, as *Hk.Tls.* 0.73 per picul.

In 1868 the first steam bean mill, whose establishment had been contemplated from the opening of the port, was built; but although the cakes manufactured in it were said to obtain a higher price in the South than the native-made article, having been made with greater economy and speed, the high hopes entertained for the venture were disappointed, and, mainly owing to opposition on the part of the Chinese, it proved a failure and was closed. It is at this time that the bean trade with Japan first comes under notice. Whether there had been surreptitious shipments prior to 1869 or not is unknown, but the fact remains that, when the embargo against export abroad was removed in that year, the figures—125,000 piculs of beans and 11,450 piculs of oil—seem too large for those of the beginnings of a trade, although the failure of the rice crop is said to have given rise to a strong demand.

In the early "seventies" there was a considerable falling off in trade, due to repeated floods in the Liao valley, though the situation was saved from becoming disastrous by the successful harvests in the north. In 1874 the price of beans and bean products fell to the lowest point ever reached and at length allowed of paying shipments being made. Another factor contributing to reduce the financial strain was that the first dressing of beancake on the southern sugar plantations was washed away by heavy rains, and had to be relaid, so that rates were raised to a high point at the end of the season. A new feature of this year was the shipment of large amounts to Shanghai for transhipment at that port: the beancake, when stored at Swatow and other southern ports, was liable to lose a good deal of weight by "sweating," and this loss was obviated by storage in the drier, cooler climate of Shanghai until the goods were called for. In this year also the shipments in foreign bottoms first exceeded those in junks, one reason assigned for the change being that imports were, in the absence of ready cash, paid for in beancake. In 1875 the real turn of the tide began after the depression. Though bean oil was in small demand and prices paid for it low, the cake industry was flourishing, as the area of sugar cultivation in the South was being extended, and the price of 10 cakes rose from Tls. 2.90 in the spring to Tls. 3.35 in the autumn. The proportion of beans brought down the Liao in boats in this year was very high, the amount being 4 million piculs out of a total of 5,400,000 piculs, the remainder coming in to Newchwang by cart. Out of this harvest, 1 million piculs of cake were shipped, with 11,640 piculs of oil, in making which 1,800,000 piculs of beans were consumed (some oil being used locally). The year was considered as one of great activity, the mills doing without the usual three weeks rest at midsummer; and the following years witnessed a rapid appreciation of prices, together with great increases in the general trade of the port. The proportion of cake carried in foreign bottoms was, in 1878, nearly three to one of that taken by junks; the demand from Swatow had received a great impulse from the success of the sugar export trade from that port to England, America, and Australia (this trade was now entering on a period of prosperity, Java sugar not yet being able to compete with it); and the only unsatisfactory feature of the time was that the carriage of oil had received a set-back owing to the fact that some shipments had arrived at their destination in a ruined condition, due to the dampness of the beans when they were converted into oil. Adulteration, so often a subject of complaint in the export trade, had become a fine art in the bean industry, the beans being watered on their way down the Liao—at certain points on the banks the cargo was turned out and sprinkled with water by experts (special localities having water peculiarly suited to the purpose).

In 1880 an experiment was made with Manchurian cake as a fertiliser in the coffee plantations in Ceylon; but, although a high opinion was formed of its qualities, the expenses of the transaction were too great to warrant further trial. In Hawaii the same obstacle prevented any development of trade—the fact being that distances were too great at this early stage of steam shipping; later on the true market for the product was to be found in Japan.

The years 1879 to 1881 were poor, for, although the harvests were excellent, drought in the South caused a cessation of active demand, thus affording another illustration of the tradal interdependence of the remote provinces of the Chinese Empire. In 1882, however, over 2 million piculs of beans and nearly the same amount of cake went out, and the oil trade began to show signs of reviving. In the late "seventies" freights had been greatly reduced, and this factor aided the oil industry, together with the fact that bean oil had now become far more economical for builders and painters purposes than wood oil (the latter, although costing far less than in the "sixties," still being double the price of the former). At the same time, however, a formidable competitor in the native market—kerosene oil—was entering the field as an illuminant.

After two years of flood and losses, good conditions were restored in 1887, which was the best year since the opening of the port, over 2 million piculs of beans and 2½ million piculs of cake going out. As beans valued at Tls. 2.50 in Newchwang cost Tls. 4.58 in Canton, large profits were made by native dealers. This year also marked the turning-point in the trade with Japan. In 1886 export of beans and their products to that country had entirely ceased; since 1880, when the failure of oil-bearing crops in Japan had induced the shipment of 133,000 piculs of beans and nearly half that amount of cake, there had been a steady decline. But the present revival, though small in itself, was the beginning of greater things, and led to the attention of Japanese merchants being directed to the vast possibilities of Manchurian agriculture. The failure of the bean crop in Korea in 1888 had the effect of stimulating the dying export trade from Manchuria, for Japan had depended in the past for its supplies of cake mainly on Korea. The failure at the same time of the ground-nut crop in South China caused a strong demand for both beans and cake; and the terrible flood season of 1888 having been succeeded by a bountiful harvest in the following year, the "nineties," which were to witness such remarkable changes in the country, opened full of promise, with an exportation of 5,200,000 piculs of beans and cake combined. A second failure of the crop in Korea in 1891, coupled with scarcity of fish manure and the discovery that beancake was far more beneficial as a manure to the rice crops than fish residue, caused a 38 per cent. increase in bean exportation and a 39 per cent. increase in cake exportation to Japan; at the same time the oil industry was so stimulated by repeated failures of ground-nuts in the South that the export of oil reached the unprecedented figure of 121,000 piculs.

The progress of the trade to this new starting-point is summed up in a report by the Statistical Secretary of the Customs in 1891. It had been built up to its position at that time by cheap freights and quick transit. The tonnage of vessels trading with Newchwang had increased from 66,000 in 1871 to 159,000 in 1881 and 335,000 in 1891. The export trade in the 20 years had increased by 456 per cent.; and the situation was reviewed very favourably, future progress depending, as was pointed out, on the improvement of the means of communication and transportation. No glimmer of any idea that beans might ever form an object of trade with Europe had yet manifested itself—the impossibility of any such trade ever becoming feasible was an accepted article of faith since MEADOWS' assertion to that effect.

The decrease of exportation of beancake to coast ports, owing to poor sugar crops in the South, would have resulted in northern dealers finding themselves overstocked after 1892, had not the Japanese demand, together with further orders from Java, come opportunely to save the situation by opening new markets for the produce. The colonisation of Manchuria was no longer frowned upon by the Government, and the opening up of new areas, notwithstanding the fact that much of them was given up to poppy cultivation, had resulted in a considerable increase in production, so that the extension of the market had become a necessity.

After the China-Japan war development proceeded apace. The system of forward contract buying of beancake prior to the arrival of the produce enabled the Japanese dealers to buy up the larger portion of the crop in 1896, when trade had resumed its normal course, and the absence of duty on cake imported to Japan gave the market there an advantage over that in South China. Failure of the ground-nut crop, now a familiar feature in the agriculture of Kwangtung, sent the price of bean oil up from *Hk.Tls.* 3.14 in 1892 to *Hk.Tls.* 5.17 in 1896, and since then the demand from that province has increased to such an extent that, even independently of the recently-created foreign demand, the price has remained at double the average figure which prevailed for so many years. In 1896 a steam bean mill began working, and (unlike its unfortunate precursor) met with instant success, which led to the erection of others—one each in 1899, 1900, and 1901,—so that the output of cake and oil was largely increased by the end of the century, the total output of these four mills being 15,600 cakes daily.

1898 and 1899 were each "record" years, trade in exports showing an advance of 206 per cent. in 10 years. In 1899 an import duty was levied for the first time on the beans and cake entering Japan; but no adverse effect was felt, the trade being now firmly established. The first careful estimate of production in Manchuria was made in 1900, by Sir A. HOSIE, who calculated the amount at 600,000 tons; but Newchwang was no longer to keep the whole trade in its hands, for Dalny, the terminus of the new Chinese Eastern Railway line, was begun in 1898, and by 1902 the Russians were making strenuous efforts to attract freight. After the Russo-Japanese war, which left the Japanese in possession of the Kwantung peninsula, the rapid development of the bean trade became a matter of course, and Dairen (the new name for Dalny) soon rivalled Newchwang in the volume of export carried out. The importation of beancake to Japan, which in 1899 amounted to slightly over 2 million piculs, rose to 3 million piculs in 1905, to 4 million piculs in the following year, and by 1908 had reached the very high figure of 7¼ million piculs, of which over 2½ million piculs were imported from Dairen. There is a small export to Japan from Russian Asia, while that from Chefoo is steadily decreasing. The following figures show the market value, per piece, of cake imported to Japan during a period of 11 years:—

1899.	1900.	1901.	1902.	1903.	1904.	1905.	1906.	1907.	1908.	1909.
Gold Yen.	*Gold Yen.*	*Gold Yen.*	*Gold Yen.*	*Gold Yen.*	*Gold Yen.*	*Gold Yen.*	*Gold Yen.*	*Gold Yen.*	*Gold Yen.*	*Gold Yen.*
1.26	1.28	1.18	1.09	1.21	1.58	1.54	1.52	1.64	1.39	1.18

The fall in value during the last two years is due to the increased supply and to the depreciation of silver.

BEGINNINGS OF THE EUROPEAN TRADE.

During the Russo-Japanese war the vast armies which occupied the whole of South and Central Manchuria depended for their cereal food largely upon the local supplies, and a great impulse was given to Manchurian agriculture at that time. But after the withdrawal of the troops the cessation of local demand called, in the natural course of events, for the discovery of a fresh market, and especially so for the money crops of wheat and beans. The market for these crops seemed at first to be the neighbouring one of Japan, and the trade *viâ* Vladivostock received the earliest benefit from the new development; but when the *post-bellum* wave of depression swept over Japan the demand ceased there, and it became necessary to find a new field for the consumption of the surplus supplies. Before the creation of this new situation farmers had been content to plant small areas with but slight annual increase, merely adjusting the supply to the restricted demand; but the time was now ripe for a great development of the trade.

It was in November 1908 that Messrs. Mitsui & Co. made the first considerable trial shipment to England. The result was so satisfactory that an order for a large consignment followed, and in March 1909 the first large cargo—5,200 tons—was landed in Hull. Contracts were at once made, as the suitability of the new oil seeds for many purposes became known and the good condition in which they arrived. During the season 400,000 tons were exported, almost all to England, and "many of the large oil crushing mills set their entire plant to work on the crushing of the beans, to the exclusion of cotton seed, linseed, and other oleaginous seeds; the supposed shortage of the flax and cotton crops in the United States and the anticipated shortage of linseed in the Argentine, with the resultant scarcity of cotton seed and linseed products, found the English market comparatively unperturbed, for the reason that soya oil and cake can supply most of the requirements as well."* Messrs. Lever Brothers, of Port Sunlight, were the first soap manufacturers to use bean oil on an extensive scale, and were followed shortly by others, so that the demand increased to such an extent that for the new season (1909–10) 50 steamers were chartered to load beans at Dairen and Vladivostock, 300,000 tons, worth £2,000,000, being contracted for in December alone. Unfortunately, adverse conditions prevailed throughout this season. With the close of the preceding season the price of beans, as usual, sank to a low figure; but with the arrival of the now crops prices rose steadily and uninterruptedly until, as the time for the fulfilment of contracts approached, they had gone above the figures quoted. Stocks were now held back by native dealers in anticipation of further advances, and those who had contracted to supply foreign buyers were unable or unwilling to fulfil their bargains, so that the latter were compelled to buy in the open market, with the result that the price rose (in February) to the unprecedented figure of (Silver) *Yen* 4.36 per picul.* During the rest of the season the price has been maintained at a figure never below *Yen* 3.90, and the approach of another season finds it well above *Yen* 4. The general trend of events seems to indicate that the "charter" system of shipment will give place to dealings on an "order" basis, but the sustained demand for beans seems likely to keep prices up. What the 1910–11 season will bring forth—whether there will be a repetition of last season's perturbed conditions, or whether the trade is about to settle down to a period of quietude and peaceful development—are questions on the answer to which the future of the bean trade may depend.

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* Extract from article in "The Economist."

The removal of the duty which had until this year (1910) been imposed on beans in Germany, followed by similar action on the part of the Canadian Government (which is said to be desirous of obtaining soya beans as feed for hogs, in order to revive the bacon trade), has opened fresh channels for export and stimulated competition for the raw material. But apart from this, the bean oil trade seems likely to receive the most rapid development: the first steamer to carry away a cargo of the oil in tanks has recently visited Newchwang. At present bean oil is carried in old kerosene oil tins or drums; but the method is not very satisfactory, complaints being made of loss by leakage. The tins cannot be returned to Manchuria, for freight is too high, and casks are not so suitable for stowing as tins in cases, so that the solution of the problem of conveying the oil to Europe seems to lie in the tank steamer, which would take the oil as a return cargo.

BEAN OIL AND CAKE PRODUCTION IN SOUTH MANCHURIA.

There are now at Newchwang one Japanese hydraulic bean mill (the Kodera, which may open a branch at Dairen), seven large Chinese steam mills, five small oil-motor mills, and nine crush-stone mills worked by animals. The output of the port from 1907 to 1909 was as follows:—

	1907.	1908.	1909.
	Piculs.	*Piculs.*	*Piculs.*
Oil	280,000	320,000	360,000
Cake	2,896,000	3,312,000	3,726,000

The exports during these three years respectively, through both Maritime and Native Customs, were: cake, 3¾ million, 4¾ million, and 5⅓ million piculs; oil, 174,000, 370,000, and 568,000 piculs.

At Antung (where, though at present the industry is of small proportions, it is capable of development) there are 12 Chinese crush-stone mills, and one steam mill owned by a joint

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* *Vide* comparative chart of monthly values at Dairen at end of this report.

Chinese and Japanese enterprise (this mill has been running since last year). The total output of these mills is probably only about 25,000 piculs of cake annually, and it is consumed locally or taken away by junks. At Liaoyang the native mills have a daily capacity of some 4,000 beancakes with a corresponding proportion of oil, and, in fact, every town in the bean country has its quota of mills, whose output is susceptible of increase if the demand requires it.

At Dairen, besides some 40 native mills which can turn out 5,000 cakes daily, there are two large modern mills—the San Tai, a joint concern, with hydraulic power and a daily capacity of 6,000 cakes, which began work in April 1908; and the Nisshin, an electric mill, which has been at work since June of the same year, and can make 4,000 cakes daily. The united outturn of all these mills in 1909 was 2,214,624 cakes and almost 100,000 piculs of oil. This was an advance of 50 per cent. on the preceding year; but the figures are disappointing, as the total output in a 10-months working year should be 4½ million cakes. The mills in Dairen are primarily intended for cake manufacture; the oil is shipped to Japan for transhipment to Europe by large Japanese firms, and, as the Chinese manufacturers refuse to make oil without an 80 per cent. advance of "earnest money," direct trade has hitherto been slack. But the figures for the present year show that the industry is entering on the upward path, for although the figures for cake export show considerable diminution, the exportation of oil—which in 1909 totalled 162,000 piculs for the whole year (an advance of 105,000 piculs over 1908)—has already, in the first nine months of 1910, exceeded 200,000 piculs. This increase is due to higher exportation to foreign countries, the amount exported this year being already treble that of 1909. Direct shipments to Europe have increased from 8,000 to 38,000 piculs in the same time. That a promising future awaits this industry admits of no doubt.

A few notes on various items connected with business transactions have been collected.

Freights.—During the autumn of 1908, when the bean trade was in its infancy, freights were very low, 22*s.*, 21*s.* 6*d.*, 20*s.*, and even as low as 19*s.* per ton being booked; but towards the end of the year the rates steadied, and by the end of December 24*s.* 6*d.* to 25*s.* 6*d.* were asked and taken. At these figures the market remained steady until March, when another rise occurred, and from then on to July rates rose steadily to 30*s.*, one charter being even signed as high as 31*s.* During the latter part of July and the beginning of August the market took a turn, and bookings were made from anywhere between 24*s.* 6*d.* and 28*s.* 6*d.* for October–November and December sailings, 26*s.* to 28*s.* for January–April sailings, and 28*s.* to 30*s.* for April–July loading. For bean oil the rate of freight has, in the two years since shipments to Europe began, remained constant at 36*s.* net per ton weight. Beancake has only been sent to Europe in sample lots from Dairen, shipments from Newchwang having proved failures; the rate for these sample shipments has been 30*s.* per ton.

Insurance.—Foreign companies began by charging ¾ per cent., but the rate fell as low as ½ per cent.; last season ⅝ and ¾ per cent. were the rates, and for the coming season nothing has as yet been decided.

Charges.—The Dairen Wharf charges for loading beans and cake into steamers are, at present, 20 sen per ton; for re-weighing, 20 sen per carload of 20 bags; for loading into and discharging from cars, 35 sen; and for stevedorage, 15 sen; while the railway freight from Changchun is (Gold) *Yen* 8.30 per ton—the total cost from Dairen being thus, exclusive of re-weighing charges, *Yen* 9 per short ton (1,512 catties), or 60 sen per picul.

Expenses of Production.—It is difficult to arrive at exact figures for this heading, but the following is given as an average:—For 10 acres, per annum: wages, $70; labourers food, $30; food for stock, $35; seed, $10; taxes, $10; sundries, $6—total, about $160. The ordinary northern farm covers 50 to 60 acres.

London Market Prices.—There was as much variation in London prices of beans as in freights. Business was done during the autumn of 1908 at £4 15*s.* per ton, and rose by jumps of 2*s.* 6*d.* to £5 17*s.* 6*d.*, and 1909 opened at that figure. The advance steadily continued, and by the middle of February £6 7*s.* 6*d.* was quoted for June–July deliveries. At this price, however, European demands seem to have slackened, as, after remaining steady for close on three weeks, the market began slowly receding, and £6 was booked towards the end of March; but the slump did not last long, as April again saw the market jump upwards, and towards the end of that month £6 15*s.* was quoted for September delivery, and at this price the market remained steady till the close of the season. For the past season the advance was continuous. The market opened in August at £6 12*s.* 6*d.* for November–December deliveries, and advanced by leaps of from 2*s.* 6*d.* to 5*s.* until it reached £8 7*s.* 6*d.* during February–March of this year (1910), when prices eased up and then fell to £7 17*s.* 6*d.*–£7 15*s.*, but soon recovered, and at the close £8 5*s.* found buyers.

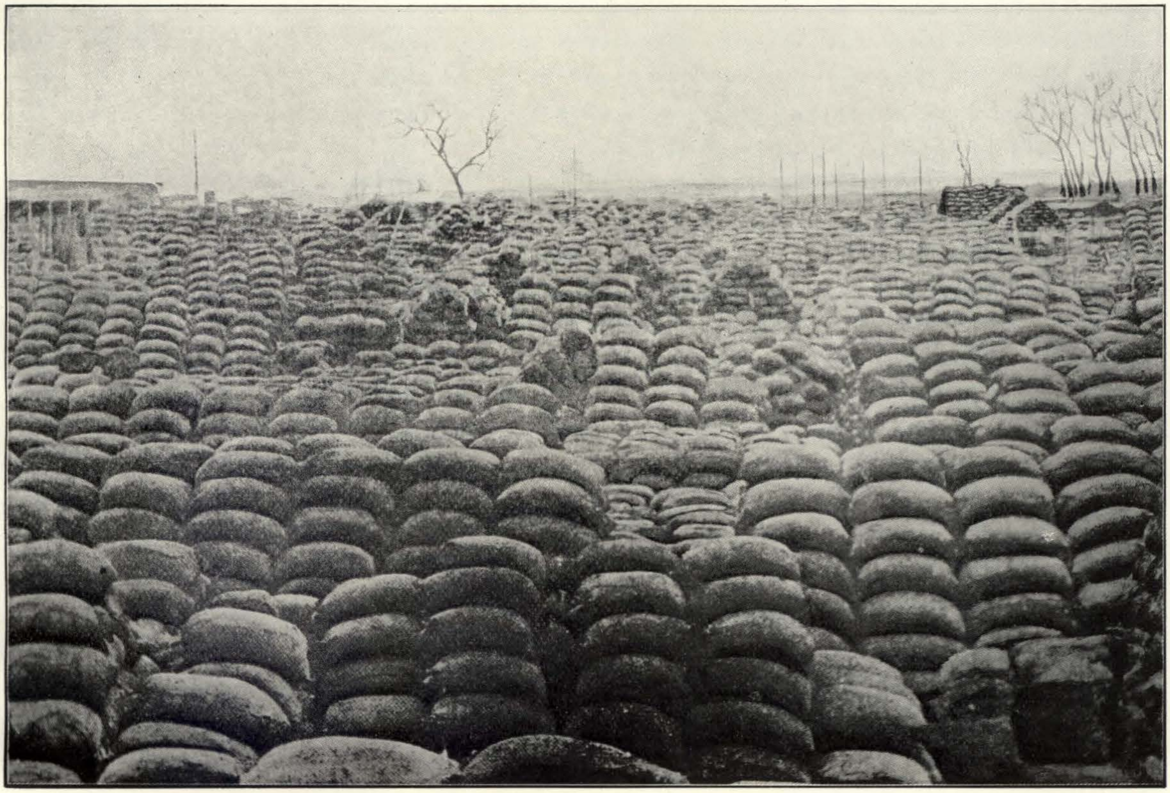
Bean Oil.—When the business started, in 1909, the first prices were from £21 10*s.* to £22 per ton net delivered weights; but by the early part of 1910 they had risen considerably, though they went down again about April and May. Recently the upward movement has again begun, and big sales have been made in England for prompt shipment from Dairen at £27 10*s.*, £28, £29, and (at the latest date) even £30, which figure seems to indicate that the oil is at the height of its popularity.

The above statement of market conditions in the two years since the trade began (with the chart giving Dairen prices at the end of this report) shows that, although there have been many fluctuations, the curve of prices has steadily progressed upwards. Prices are generally determined by a combination of factors. Fluctuations in the exchange rates on China and in the quotations on bar silver may cause great differences in values in the time between sale and delivery. Rates of insurance and freight also affect prices; and the existence of rival oil-producing seeds causes uncertainty in the market. The absence of a produce exchange at the ports of shipment is an undoubted drawback, since lack of uniformity and system in the business are at present without a corrective, and risks are inevitably taken by buyers. That the trade should be set on a firm basis no one will dispute, in view of the fact that the prosperity of Manchuria depends upon it. For the bean trade gives employment to an army of workers—boatmen, carters, mill hands, and those less directly connected with it, such as harness, cart, boat, and oil-chest makers, wheelwrights, smiths,—not to mention the farmers themselves, who, by extending the area of cultivation, are winning virgin soil to civilisation. The railways depend for their freights principally upon beans and their products, and their interests are bound up with the trade, while fresh vitality has been infused into the languishing shipping trade with Far Eastern waters. The great gain in purchasing power of the Manchurian farmers, due to the profits made in recent years, has stimulated the import trade to an extraordinary degree, as the following figures show: whereas the total trade of Manchuria—carried through its one open port, Newchwang—was, even after the awakening produced by the China-Japan war, only 33 million Haikwan taels (£5,000,000), on an average, for the years following 1895 (of which some 12 millions were imports), this figure had by 1903, the year preceding the Russo-Japanese war, risen to 50 million Haikwan taels (of which 20 millions were imports), and during 1909 the total volume of trade through the newly-opened ports and Newchwang (exclusive of the Native Customs trade at the latter port) reached 142 million Haikwan taels (of which imports account for 50 millions = £6,500,000). In the last-mentioned year exports to foreign countries contributed 56 millions of the amount, and were made up chiefly of beans, oil, and cake. Such phenomenal growth—and it was mostly a real increase of trade, for the volume of trade passing through ports other than Newchwang before their opening was slight—augurs well for the future.

That this development will continue, though possibly not with such great strides, seems probable from certain considerations. The population of the country is rapidly increasing under Government encouragement, and as Manchuria fills with a sturdy agricultural people communications will be developed. The Changchun-Kirin Railway, now under construction, will in a couple of years open the way to the development of the Sungari region to its fullest capacity, and if this line is continued to the Korean frontier new districts will be thrown open; while the Chinchow-Aigun line, or at least a portion of it, would, if constructed, traverse a country where beans might thrive. The eager competition to secure beans in Europe shows no signs of slackening; and the North American continent appears to be about to enter the field as a consumer, for a large shipment of beancake has just been sent to Seattle, and there appears to be a very good opening for the product on the Pacific coast, where the heavy railway freights from the east have caused dairymen and feeders to look round for a cheaper feed than that which comes across the Rockies. With freight from Dairen to Seattle at only (Gold) $4 per ton a good market should be developed. Soya beans are being grown in British West Africa, and experimental planting is carried on in practically every British colony; but it seems doubtful whether such experiments can meet with success in competition with the Manchurian product, which is raised under ideal climatic conditions and by the cheapest possible labour. The general impression prevailing seems to be, therefore, that the bean trade has a good future before it; that the time of stress through which it is passing will not last much longer, and that business will settle down when once normal conditions have been restored.

CHIEF SOURCES OF SUPPLY.

With regard to the areas of production and the relative amounts of the crops which will in years to come be shipped from Dairen and Vladivostock, the general consensus of opinion appears to be that the northern source of supply will assume the greater importance and



Accumulation of Beans awaiting Loading into Trains at Changchun.

Vladivostock take the larger share, though it must not be forgotten that a new competitor may enter the field some day—one of the North Korea ports. The reasons given in support of this conclusion are that the area of cultivation in the regions along the South Manchuria Railway line is already cultivated, and that development can only take place northwards and to a certain extent to the west. It is doubtful whether farmers will plant beans in preference to other crops, as kaoliang, which is estimated to cover 60 per cent. of the soil in Fengtien province, is indispensable to them as a food crop. The discovery of the value of beans as a restoring element to the soil was accidental, it having arisen from the custom of planting them as a rotation crop with millet and kaoliang; thus they have only been planted every three years, until recently, and that they will supplant to any considerable degree these other crops is too much to hope for where the conservative Chinese peasant is concerned. Until last year a large proportion of the produce along the Chinese Eastern Railway line came down for shipment southwards to Dairen and Newchwang, but there is a growing tendency to send the beans from this region to Vladivostock. Better arrangements for transactions in beans exist in the south, and the best customers having hitherto been the southern Chinese ports and Japan, trade naturally was drawn to the more convenient ports. But with the establishment of a system of rebates to large shippers on the Chinese Eastern Railway, by which beans are taken from Kwanchengtze to Vladivostock for 15 kopecks per pood, as against 17 kopecks from Harbin itself, and with the introduction of better business methods, such as the provision of cleaning sheds at Harbin (one of the complaints against beans shipped from the Russian port having been that much dirt was mixed with them)—with these changes of method the northern beans are being diverted to Vladivostock. Although there is room for some development west of the South Manchuria Railway line, the true area for extension of the crop lies farther to the north-west and north, beyond Petuna, up the Hulan valley, and towards Mergen—the country which the suggested Chinchow-Aigun Railway's northern section would tap. In the districts which lie far north there is, however, always a risk of early frosts descending upon the harvests; but this danger could be averted by cultivating specially selected varieties which mature in the shortest possible period.

MAP REFERENCES.

In the accompanying map an attempt has been made to show the extent of the territory in Manchuria where beans are grown—to give, as far as is possible, some idea of the production of the chief bean districts, and a general view of the conditions prevailing in the trade as affected by geographical conditions. Thus, the old trade routes, both by land and water, are marked; the chief centres for collection of the produce; the railway lines existing and contemplated; and various other items which may be of interest and value. The south-east of Fengtien province, from the shores of the Yellow Sea to the forest region of the Ever-White Mountains, may be called the green bean district distinctively, though this does not imply that green beans grow here only—this is the *hinterland* of Antung, and beans are only a by-product, the Yalu basin being devoted chiefly to the cultivation of maize and beans being grown between the rows for the most part. The country round Liaoyang is famous for its black beans, very large ones being produced in this region. The round golden variety comes from the highlands north of Moukden, which extend to the Upper Sungari above Kirin; in the highest altitudes, such as those about Hailungfu, early frosts constitute a danger to the ripe seeds, as in the northerly latitudes. In the valleys of the Liao, the Sungari, and the Nonni there is the disadvantage of liability to floods, such as those which have devastated the Tsitsihar and Petuna districts this year (1910) and the more recent flood at Sinmintun. North-west of Fakumen the meadow lands produce the white-eye variety—best of all, wherever it grows; while the newly-opened grass lands south of Petuna grow beans rich in oil, and if the adjacent Mongolian plains are ever developed as they should be, as pasture for vast herds of cattle, these beans are close at hand to provide the ideal fodder for fattening the stock—converted into a constituent of animal food the beans would thus realise equal profits for the farmer. In the north the Hulan valley is very fertile, and there is a vast unopened tract waiting for development; beans are grown in small quantities even in these regions, especially since the opium prohibition enactments, and are found as far north as Aigun—here they are occupying the soil formerly devoted to the poppy.

NORMAN SHAW,
4th Assistant, A.

CUSTOM HOUSE,
DAIREN, *31st December* 1910.

SUPPLEMENTARY NOTE.

On page 7, § (*a*.), ii, a description was given of the method of preparing bean paste in China; Japanese bean paste, or miso, is differently prepared. There are three kinds of miso:—

1°. Shiro, or white, miso: the constituents of which are a large quantity of beans well boiled (whereas in making soy only a small quantity is used proportionately), yeast made of rice, and salt—these are pounded in a mortar, placed in an earthenware jar, which is closely covered, and left for some days, when the paste is ready.

2°. Aka, or red, miso: made by the same process, with wheat yeast substituted for rice yeast.

3°. Nuka miso: made in the same way, but with bran (nuka) yeast.

APPENDIX.

TABLE SHOWING VALUES PER PICUL OF BEANS, BEANCAKE, AND BEAN OIL AT NEWCHWANG, 1864–1909.*

YEAR.	BEANS.	BEANCAKE.	BEAN OIL.	YEAR.	BEANS.	BEANCAKE.	BEAN OIL.
	Hk.Tls.	*Hk.Tls.*	*Hk.Tls.*		*Hk.Tls.*	*Hk.Tls.*	*Hk.Tls.*
1864....................	1.25	...	6.25	1887....................	0.92	0.80	2.69
1865....................	1.20	...	4.33	1888....................	1.06	0.80	2.92
1866....................	1.20	...	4.60	1889....................	1.07	0.84	4.12
1867....................	1.05	...	4	1890....................	0.99	0.81	4.50
1868....................	0.95	...	3.70	1891....................	0.90	0.74	3.46
1869....................	0.90	...	3.15	1892....................	0.90	0.78	3.14
1870....................	1	0.73	3.90	1893....................	1.31	1	3.79
1871....................	0.96	0.71	3.98	1894....................	1.04	0.94	3.94
1872....................	0.93	0.68	3.71	1895....................	1.20	1.02	4.24
1873....................	0.83	0.65	3.19	1896....................	1.46	1.18	5.17
1874....................	0.77	0.62	2.30	1897....................	1.78	1.28	6.56
1875....................	0.87	0.67	2.32	1898....................	2.04	1.62	6.06
1876....................	1.07	0.73	3.75	1899....................	1.85	1.55	6.61
1877....................	1.15	0.90	3.91	1900....................	1.59	1.35	5.66
1878....................	0.91	0.80	3.86	1901....................	2.20	1.62	6.80
1879....................	0.94	0.76	3.60	1902....................	1.91	1.39	4.69
1880....................	0.82	0.67	2.58	1903....................	2	1.54	6.49
1881....................	0.81	0.64	3.52	1904....................	2.98	1.87	7.85
1882....................	0.87	0.68	2.79	1905....................	3.12	2.45	10.17
1883....................	0.86	0.69	2.90	1906....................	2.13	1.85	6.91
1884....................	0.89	0.72	3.44	1907....................	2.49	2.35	8.65
1885....................	0.90	0.68	3.03	1908....................	2.34	2.21	8.88
1886....................	1.02	0.81	3.22	1909....................	2.80	2.17	7.24

* From Customs returns.

STATEMENT SHOWING ESTIMATED BEAN PRODUCTION OF MANCHURIA IN NORMAL YEARS, COMPILED BY THE SOUTH MANCHURIA RAILWAY COMPANY IN 1909.

FENGTIEN PROVINCE :—	*Tons.*	*Tons.*
Tungpien Intendancy:		
North—		
Linkiang	600	
Tunghwa	5,600	
Chian	3,550	
Hwaijen	9,500	
Liuho	5,400	
Hingking	16,400	
South—		
Kwantien	4,500	
Fenghwangcheng	11,100	
Antung	8,450	
Siuyen	6,700	
Chwangho	28,050	
		99,850
Kwantung Leased Territory	10,100	
		10,100
Chinchowfu:		
Suichung	9,000	
Chinchow	42,200	
Kinsi	7,750	
Ichow	20,000	
Ningyüan	22,000	
Kwangning	12,550	
		113,500
Sinminfu:		
Chenan	28,900	
Changwu	17,550	
Sinmin	17,400	
Panshanting	3,550	
		67,400
Fengtienfu:		
South of Moukden—		
Fuchow	37,950	
Kaiping	16,050	
Haicheng	25,050	
Liaoyang	70,800	
Liaochung	40,200	
Penkihu	13,700	
Moukden	109,800	
		313,550

Note.—The beans produced in the above districts of Fengtien province and Kwantung are inferior in quality, the soil in South Manchuria being less adapted to their cultivation than in the north.

	Tons.	*Tons.*
North of Moukden—		
Tiehling	54,300	
Kaiyüan	24,300	
		78,600
Hailungfu:		
Sifeng	69,950	
Sian	22,900	
Hailung	36,000	
Tungping	16,800	
		145,650
Changtufu:		
Changtu	56,000	
Fakumen	66,600	
Kangping	13,700	
Fenghwa	106,450	
Liaoyüan	1,850	
Hwaite	13,900	
		258,500
Taonanfu:		
Kaitung	1,000	
Taonan	3,650	
Ankwang	250	
Tsingan	300	
		5,200
Total, South Fengtien Province and Kwantung		604,400
„ North Fengtien Province		487,950
TOTAL, FENGTIEN PROVINCE		1,092,350
KIRIN PROVINCE:—		
Kirinfu	110,000	
Changchunfu	115,200	
Itungchow	39,500	
Nungan	90,200	
Petuna	37,050	
Yüshuhsien	45,100	
Shwangcheng	48,600	
Wuchang	13,050	
Pinchow	60,400	
Changshow	8,900	
Ilanfu	4,800	
Suifen	11,900	
Hunchun	12,000	
* Tatung	7,700	
* Tangyüan	11,900	
Linkiangchow	10,200	
		626,500

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* These places are given in the Postal Map as in Kirin, but by another source as in Heilungkiang.

HEILUNGKIANG PROVINCE:—	Tons.	Tons.
Hulan	30,000	
Lansi	11,250	
Suihwa	24,000	
Yüking	27,200	
Mulan	14,000	
Payen	36,400	
Hailun	132,000	
Tsingkang	3,300	
Paichwan	2,100	
		280,250
GRAND TOTAL FOR ALL MANCHURIA		1,999,100

In connexion with the above statement, the following further note may be useful by way of a check on the figures (the estimates for 1906–09 are from British Consular reports; that for 1910 is by a local British merchant):—

ESTIMATES OF BEAN PRODUCTION OF MANCHURIA FOR THE LAST FIVE YEARS.

1906.	1907.	1908.	1909.	1910.
Tons.	*Tons.*	*Tons.*	*Tons.*	*Tons.*
600,000	Varying from 600,000 to 900,000	1,500,000	1,150,000	1,400,000

These estimates fall far short of the figures given in the Railway Company's statement; but it must be remembered that the estimates take no count of the poor quality green beans of the south-east and, to some extent, of the region south of Moukden, so that the discrepancy between the two figures (say, 400,000 to 500,000 tons) is thus accounted for.

The South Manchuria Railway gives the following figures showing proportions contributed to the total by each variety of bean:—

	Tons.	
Yellow	1,238,000	
White-eye	59,000	
Black-eye	50,000	
Green	145,000	(small green, not soya, 43,000 tons).
Black	53,000	
TOTAL	1,545,000	

TABLE SHOWING TOTAL EXPORT OF BEANS FROM MANCHURIA, 1909.*

——	BEANS.		CAKE.		OIL.	
	Piculs. =	*Tons.*	*Piculs.* =	*Tons.*	*Piculs.* =	*Tons.*
Aigun	...	...	...	...	...	...
Sansing	8,043	536	...	...	4,137	276
Lahasusu	670	45	...	...	...	...
Manchouli	...	...	...	...	3,991	266
Harbin	22,327	1,488	909	61	9,908	661
Suifenho	3,841,952	256,130	207,550	13,836	5,912	394
Antung	24,651	1,643	245,244	16,350	139	9
Tatungkow	3,183	212	174,752	11,650	...	...
Dairen	7,686,985	512,466	4,782,382	318,825	162,755	10,850
Newchwang	3,564,310	237,621	5,347,491	356,499	568,091	37,873
TOTAL	15,152,121	1,010,141	10,758,328	717,221	754,933	50,329

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* From Customs returns.

Taking total bean export *plus* amount of beans consumed in manufacture of above total of cake (that is, $\frac{9}{100}$ths more, or 64,549 tons), the grand total is—

	Tons.
Beans	1,010,141
„ used in manufacture of cake	781,770
TOTAL	1,791,911

This total, as compared with the Railway Company's statement, leaves some 200,000 tons for local consumption and for that amount which is sent by junk from Native Customs not under Imperial Maritime Customs control (Mr. UNWIN, in the Chefoo Trade Report for 1909, says that beans in very large quantities cross the gulf in this way, and they go also to other ports than Chefoo).

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* Out of print.